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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/543,138	07/22/2005	Thomas Bosselmann	2002P14382WOUS	4355

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EXAMINER	
DUNLAP, JONATHAN M	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/543,138	BOSSELMANN ET AL.	
	Examiner	Art Unit	
	Jonathan Dunlap	2855	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *20 September 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *18-37* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *18-37* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

2. **Claims 18**, **23-25**, **28-35** and **37** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Twerdochlib et al.** (**U.S. Patent 5,479,826**) in view of **Gray** (**U.S. Patent 4,131,889**)

Considering **claims 18,** Twerdochlib discloses a method for determining stress of at least one turbine blade or vane of a plurality of turbine blades or vanes that are arranged in rows of a turbine machine comprising:

- Providing at least one electromagnetic wave emitter **42** for emitting at least one electromagnetic emission wave (**Figure 4a; Column 4, line 12**);
- Providing at least one electromagnetic wave receiver **50** for receiving at least one electromagnetic receive wave (**Figure 5a; Column 4, line 47**);
- Analyzing the electromagnetic receive wave via at least one analyzer (**Figure 5a; Column 5, lines 2-10; Column 4; lines 46-62**);
- Converting the electromagnetic emission wave into the electromagnetic receive wave by at least partially reflecting the electromagnetic emission wave by providing the at least on turbine blade or vane with a reflection surface (**Column 4; lines 46-62**);

- Arranging the electromagnetic wave emitter and the electromagnetic wave receiver at at least one location between the blade or vane rows and operatively connected to the reflection surface of the turbine blade or vane (**Figure 4a; Column 4, lines 14-18**);

- Matching the electromagnetic emission wave to a surface from of the blade or vane (**Column 5, lines 10-47**);

- Emitting the electromagnetic emission wave by the electromagnetic wave emitter (**Column 4, lines 13-15**);

- Converting the electromagnetic emission wave into the electromagnetic receive wave by the reflection surface of the blade or vane (**Figures 5a-5b; Column 4, lines 49-55**);

- Receiving the electromagnetic receive wave by the electromagnetic wave receiver (**Figures 5a-5b; Column 4, lines 49-55**); and

- Determining the stress of the blade or vane by analysis to assist in determining component integrity by analyzing the received electromagnetic receive wave to effect an evaluation of the reflection surface by the at least one analyzer (**Column 1, lines 10-24, lines 35-51; Column 3, lines 29-56; Column 5, lines 2-25**).

The invention by Twerdochlib, fails to disclose that the stress of the blade or vane is determined via frequency analysis.

3. However, Gray teaches determining the stress of the component by frequency analysis (**Column 1, lines 10-26; Column 2, lines 25-44; Column 3, lines 3-9, lines 36-45**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize frequency analysis as taught by Gray in the invention by Twerdochlib. The motivation for doing so is found in the teachings of Gray, "the variable component oscillates in amplitude at the difference or Doppler frequency" (**Column 3, lines 21-22**). While Twerdochlib discloses emission of a standing wave, the vibration of the turbine blade may induce a different receive wave. Through the frequency analysis of Gray, the difference or Doppler frequency can be determined.

Considering **claim 23**, Twerdochlib discloses that analyzing the received electromagnetic wave comprises an evaluation of a vibration status of the reflection surface used for determining the stress (**Column 1, lines 10-24, lines 35-51; Column 5, lines 2-25**).

Considering **claim 24**, Twerdochlib discloses that the electromagnetic emission wave comprises at least one electromagnetic emission wave having a wavelength based on a surface shape of the reflection surface (**Column 5, lines 37-45**).

Considering **claim 25**, the invention by Twerdochlib fails to disclose that the frequency of the emission wave is compared to the frequency of the receive wave

4. However, Gray teaches that the evaluation of the vibration status comprises comparing a frequency of the electromagnetic emission wave and to a frequency of the

electromagnetic receive wave (**Column 1, lines 10-26; Column 2, lines 25-44; Column 3, lines 3-9, lines 36-45**).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to evaluate a vibrational status by comparing an emitted wave to a received wave, as taught by Gray in the invention by Twerdochlib. The motivation for doing so is found in the teachings of Gray, "the variable component oscillates in amplitude at the difference or Doppler frequency" (**Column 3, lines 21-22**). While Twerdochlib discloses emission of a standing wave, the vibration of the turbine blade may induce a different receive wave. Through the frequency analysis of Gray, the difference or Doppler frequency can be determined.

Considering **claim 28**, Twerdochlib discloses that determining the stress of the turbine component is executed while an operation of the turbine machine (**Column 3, lines 29-31**).

Considering **claim 29**, Twerdochlib discloses that the electromagnetic emission wave is a radar wave (**Column 2, lines 7-12; Column 4, lines 10-15; Column 5, lines 33-45**).

Considering **claim 30**, Twerdochlib discloses a turbine machine, having a device for determining a stress of at least one turbine blade or vane of a plurality of turbine blades or vanes that are arranged in rows of the turbine machine comprising:

- At least one electromagnetic wave emitter **42** for emitting at least one electromagnetic emission wave that is matched to a surface form of the blade or vane (**Figure 4a; Column 4, line 12; Column 5, lines 10-47**);
- At least one electromagnetic wave receiver **50** for receiving at least one electromagnetic receive wave (**Figure 5a; Column 4, line 47**);
- At least one analyzer for analyzing the electromagnetic receive wave that evaluates the reflection surface used for determining the stress via analysis (**Column 1, lines 10-24, lines 35-51; Column 3, lines 29-56; Column 5, lines 2-25**);
- The turbine component comprising a reflection surface for converting the electromagnetic emission wave into the electromagnetic receive wave by at least partially reflecting the electromagnetic emission wave (**Column 4; lines 46-62**); and
- The electromagnetic wave emitter and the electromagnetic wave receiver arranged at at least on location between the component rows and operatively connected to the reflection surface of the turbine component (**Figure 4a; Column 4, lines 14-18**).

The invention by Twerdochlib, fails to disclose that the stress of the component is determined via frequency analysis.

5. However, Gray teaches determining the stress of the component by frequency analysis (**Column 1, lines 10-26; Column 2, lines 25-44; Column 3, lines 3-9, lines 36-45**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize frequency analysis as taught by Gray in the invention by Twerdochlib. The motivation for doing so is found in the teachings of Gray, "the variable component oscillates in amplitude at the difference or Doppler frequency" (**Column 3, lines 21-22**). While Twerdochlib discloses emission of a standing wave, the vibration of the turbine blade may induce a different receive wave. Through the frequency analysis of Gray, the difference or Doppler frequency can be determined.

Considering **claim 31**, Twerdochlib discloses that the electromagnetic wave emitter and the electromagnetic wave receiver are operatively connected to the reflection surface such that by emitting the electromagnetic emission wave converting the electromagnetic emission wave into the electromagnetic receive wave and receiving the electromagnetic receive wave occur (**Figures 5a-5b; Column 1, lines 10-24, lines 35-51; Column 4, lines 13-15, lines 49-55; Column 5, lines 2-25**).

Considering **claim 32**, Twerdochlib discloses a housing with a turbine channel in which the component rows are arranged (**Column 2, lines 15-25**).

Considering **claim 33**, Twerdochlib discloses that the electromagnetic wave emitter comprises an electric vibration generator for generating an electric vibration and a transformer for transforming the electric vibration into the electromagnetic emission wave (**Figure 4a; Column 4, lines 10-16**).

Considering **claim 34**, the invention by Twerdochlib fails to disclose that the electromagnetic wave emitter and the electromagnetic wave receiver form one integrated unit.

6. However, Gray teaches that the electromagnetic wave emitter and the electromagnetic wave receiver form one integrated unit (**Column 2, lines 59-66**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to integrate the emitter and the receiver into an integral part as taught by Gray in the invention by Twerdochlib. The motivation for doing so is to reduce the number of parts required, to reduce manufacturer costs and to reduce the time required for assembly.

Considering **claim 35**, Twerdochlib discloses a radar antenna included in the electronic wave emitter or in the electronic wave receiver (**Figure 4a; Column 4, lines 10-16**).

Considering **claim 37**, Twerdochlib discloses a device for determining a stress of at least one turbine blade or vane of a plurality of turbine blades or vanes that are arranged in rows of the turbine machine comprising:

- At least one electromagnetic wave emitter **42** for emitting at least one electromagnetic emission wave that is matched to a surface form of the blade or vane (**Figure 4a; Column 4, line 12; Column 5, lines 10-47**);
- At least one electromagnetic wave receiver **50** for receiving at least one electromagnetic receive wave (**Figure 5a; Column 4, line 47**);

- At least one analyzer for analyzing the electromagnetic receive wave that evaluates the reflection surface used for determining the stress via analysis (**Column 1, lines 10-24, lines 35-51; Column 3, lines 29-56; Column 5, lines 2-25**);

- The turbine component comprising a reflection surface for converting the electromagnetic emission wave into the electromagnetic receive wave by at least partially reflecting the electromagnetic emission wave (**Column 4; lines 46-62**); and

- The electromagnetic wave emitter and the electromagnetic wave receiver sized and configured at at least on location between the component rows and operatively connectable to the reflection surface of the turbine component (**Figure 1-2; Figure 4a; Column 2, lines 15-49; Column 4, lines 14-18**).

The invention by Twerdochlib, fails to disclose that the stress of the component is determined via frequency analysis.

7. However, Gray teaches determining the stress of the component by frequency analysis (**Column 1, lines 10-26; Column 2, lines 25-44; Column 3, lines 3-9, lines 36-45**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize frequency analysis as taught by Gray in the invention by Twerdochlib. The motivation for doing so is found in the teachings of Gray, "the variable component oscillates in amplitude at the difference or Doppler frequency"

(**Column 3, lines 21-22**). While Twerdochlib discloses emission of a standing wave, the vibration of the turbine blade may induce a different receive wave. Through the frequency analysis of Gray, the difference or Doppler frequency can be determined.

8. **Claims 19-22** and **36** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Twerdochlib et al.** (**U.S. Patent 5,479,826**) in view of **Gray** (**U.S. Patent 4,131,889**) and further in view of **Harrold et al.** (**U.S. Patent 6,512,379**).

Considering **claim 19**, the invention by Twerdochlib, as modified by Gray, fails disclose a method that is executed on both a blade and a guide vane.

9. However Harrold teaches that the method is executed to determine th stress of both a turbine blade and a guide vane (**Column 6, lines 34-47**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to execute stress determination on both a turbine blade and a guide vane as taught by Harrold in the invention by Twerdochlib, as modified by Gray. The motivation for doing so is to reduce the number of components required to test various aspects of the turbine. By testing multiple aspects with a single component, the overall cost of the machine is reduced.

Considering **claims 20 and 22**, the invention by Twerdochlib, as modified by Gray, fails to disclose that analyzing the received electromagnetic wave comprises an evaluation, based on the intensity of the receive wave, of a surface quality of the reflection surface used for determining the stress.

10. However, Harrold teaches that analyzing the received electromagnetic wave comprises an evaluation, based on the intensity of the receive wave, of a surface quality of the reflection surface used for determining the stress (**Column 2, lines 45-52; Column 5, lines 8-65**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to analyze the intensity of a received wave to judge the surface quality of the reflection surface so as to determining the stress of a turbine blade or vane as taught by Harrold in the invention by Twerdochlib, as modified by Gray. The motivation for doing so is found in the teachings of Harrold, "the magnitude of the radio signals will vary according to...the component material's condition" (**Column 5, lines 40-43**). Furthermore, Harrold teaches that when two blades have identical conditions, they will have the same magnitude signal, but when one is deteriorating, the signal will be different (**Column 6, lines 23-28**).

Considering **claim 21**, Twerdochlib discloses that the matched electromagnetic emission wave comprises at least one electromagnetic emission wave comprises a wavelength based on a shape of the reflection surface (**Column 5, lines 10-47**).

Considering **claim 36**, the invention by Twerdochlib, as modified by Gray, fails to disclose that the turbine is a gas turbine.

11. However, Harrold teaches that the turbine is a gas turbine (**Abstract**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize a gas turbine as taught by Harrold in the invention by Twerdochlib, as modified by Gray. The motivation for doing so is that Twerdochlib discloses that the turbine can be any turbine, as well as Gray discloses that the turbine can be any turbine. A gas turbine is well known type of turbine, which typically has fewer parts than conventional piston combustion engines.

12. **Claims 26-27** are rejected under 35 U.S.C. 103(a) as being unpatentable over **Twerdochlib et al.** (**U.S. Patent 5,479,826**) in view of **Gray** (**U.S. Patent 4,131,889**) and further in further view of **Leon** (**U.S. Patent 4,422,333**).

The invention by Twerdochlib, as further modified by Gray, fails to disclose that the vibrational and surface quality analyses are performed simultaneously during the analysis of the received electromagnetic wave.

13. However, Leon teaches:

Considering **claim 26**, that analyzing the received electromagnetic wave comprising an evaluation of a surface quality of the reflection surface and an evaluation of a vibration status of the reflection surface, wherein the surface quality and the vibrational status are used for determining the stress

Considering **claim 27**, that the evaluation of the surface quality and the evaluation of the vibrational status are executed simultaneously (**Column 2, lines 15-32; Column 4, lines 50-55; Column 8, lines 54-68; Column 9, lines 1-2**).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to incorporate analyzing surface quality at the same time as analysis of the vibrational status of the turbine component as taught by Leon in the invention by Twerdochlib, as further modified by Gray. The motivation for doing so is found in the disclosure by Leon in that Lean teaches the use of frequency and amplitude monitoring to determine vibrational status and surface quality being used to determine the stress on a turbine blade (**Column 2, lines 14-33**).

Response to Arguments

Applicant's arguments filed September 20, 2007 have been fully considered but they are not persuasive.

Applicant states that the invention by Twerdochlib fails to provide for matching an electromagnetic emission wave to a surface form of the blade or vane.

It is the Examiner's position that Twerdochlib, in their endeavor to enhance the resolution of a turbine blade vibration monitoring system, matches an electromagnetic emission wave to a surface form of the blade or vane. Specifically, by increasing the frequency of the emitted wave, Twerdochlib is enabled to reflect a greater number of waves off of the reflecting surface of the blade or vane. Because the blade or vane reflected surface is assumed to be of constant dimensions prior to damage or vibration, the wavelength and/or frequency, which are dependant upon each other, must be less than the smallest dimension of the blade or vane in order to monitor vibration and/or faster than the rate at which the blade or vane passes in front of the emitter so as to enable the blade or vane to be monitored. It flows naturally from the prior art that so

long as the smallest dimension of the blade or vane is greater than the wavelength of the emitted wave or the speed of rotation of the blade or vane is less than the frequency of the emitted wave, the vibration is enabled to be monitored. Increasing the frequency, effectively decreasing the wavelength, enables one to enhance the resolution of the sensor. Increased resolution allows for more accurate vibration monitoring.

Conclusion

This is a continuation of applicant's earlier Application No. 10/543,138. All claims are drawn to the same invention claimed in the earlier application and could have been finally rejected on the grounds and art of record in the next Office action if they had been entered in the earlier application. The subject matter of the amendment is similar to that of the previously rejected claim 21, as acknowledged by Applicant, see page 7 of arguments submitted September 20, 2007. No new ground(s) of rejection are presented. Accordingly, **THIS ACTION IS MADE FINAL** even though it is a first action in this case. See MPEP § 706.07(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no, however, event will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jonathan Dunlap whose telephone number is (571) 270-1335. The examiner can normally be reached on M-F 8-5 with every other Friday off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward Lefkowitz can be reached on (571) 272-2180. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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September 24, 2007

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